WCWL
Western Canada Waiting List Project

HIP AND KNEE REPLACEMENT SURGERY PRIORITY CRITERIA TOOL

PLEASE PRINT CLEARLY

Provincial Health Care Number: _____
Patient Name: _____

Patient Age:_____ Sex: [circle one] M F

[Tick one box] ☐ Left Hip ☐ Right Hip ☐ Left Knee ☐ Right Knee

[Tick one box] ☐ Primary ☐ Revision

Diagnosis:_____

Surgeon's Name:_____ Phone: _____

Date:_____

Patients must be on appropriate non-surgical treatment prior to evaluation (e.g. medications, walking aids, shoe inserts)

Please check the box that most accurately describes the patient's current situation

1. **Pain on motion (e.g. walking, bending): ***
   - ☐ None/mild
   - ☐ Moderate
   - ☐ Severe

2. **Pain at rest (e.g. while sitting, lying down, or causing sleep disturbance): ***
   - ☐ None
   - ☐ Mild
   - ☐ Moderate
   - ☐ Severe

* *Take into account usual duration, intensity, and frequency of pain, including need for narcotic vs. non-narcotic medication.*

3. **Ability to walk without significant pain :**
   - ☐ Over 5 blocks
   - ☐ 1-5 blocks
   - ☐ <1 block
   - ☐ Household ambulator

4. **Other functional limitations (e.g. putting on shoes, managing stairs, sitting to standing, sexual activity, bathing, cooking, recreation or hobbies):**
   - ☐ No limitations
   - ☐ Mild limitations - able to do most activities with minor modifications or difficulty
   - ☐ Moderate limitations - able to do most activities with modification or assistance
   - ☐ Severe limitations - unable to perform most activities

(PRIOR ART)

FIGURE 1

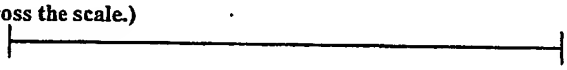
5. **Abnormal findings on physical exam related to affected joint (e.g. deformity, instability, leg length difference, restriction of range of motion on examination):**
   - ☐ None/mild
   - ☐ Moderate
   - ☐ Severe

6. **Potential for progression of disease documented by radiographic findings (e.g. recurrent dislocation, x-ray evidence of protrusion, significant bone loss, component wear, impending fracture):****
   - ☐ None
   - ☐ Mild
   - ☐ Moderate
   - ☐ Severe

   ** Predominantly applies to revisions, use in primary cases only in special circumstances (e.g. ligament instability, bone loss)

7. **Threat to patient role and independence in society (i.e. ability to work, give care to dependants, live independently (difficulty must be related to affected joint)):**
   - ☐ Not threatened but more difficult
   - ☐ Threatened but not immediately
   - ☐ Immediately threatened or unable

8. **All things considered, how would you rate the urgency or relative priority of this patient?**
   (Draw a line across the scale.)



Not Urgent at all — **Extremely Urgent (just short of an emergency)**

9. **In your clinical judgement what should be the maximum waiting time for this patient?**
   Number of weeks_____ OR Number of months _____

10. **In your practice how long would it take this patient to have surgery done from the time you first see the patient?**
    Number of days _____ OR Number of weeks _____ OR Number of months _____

Please record any comments on the form, criteria or process: _____

(PRIOR ART)

FIGURE 2

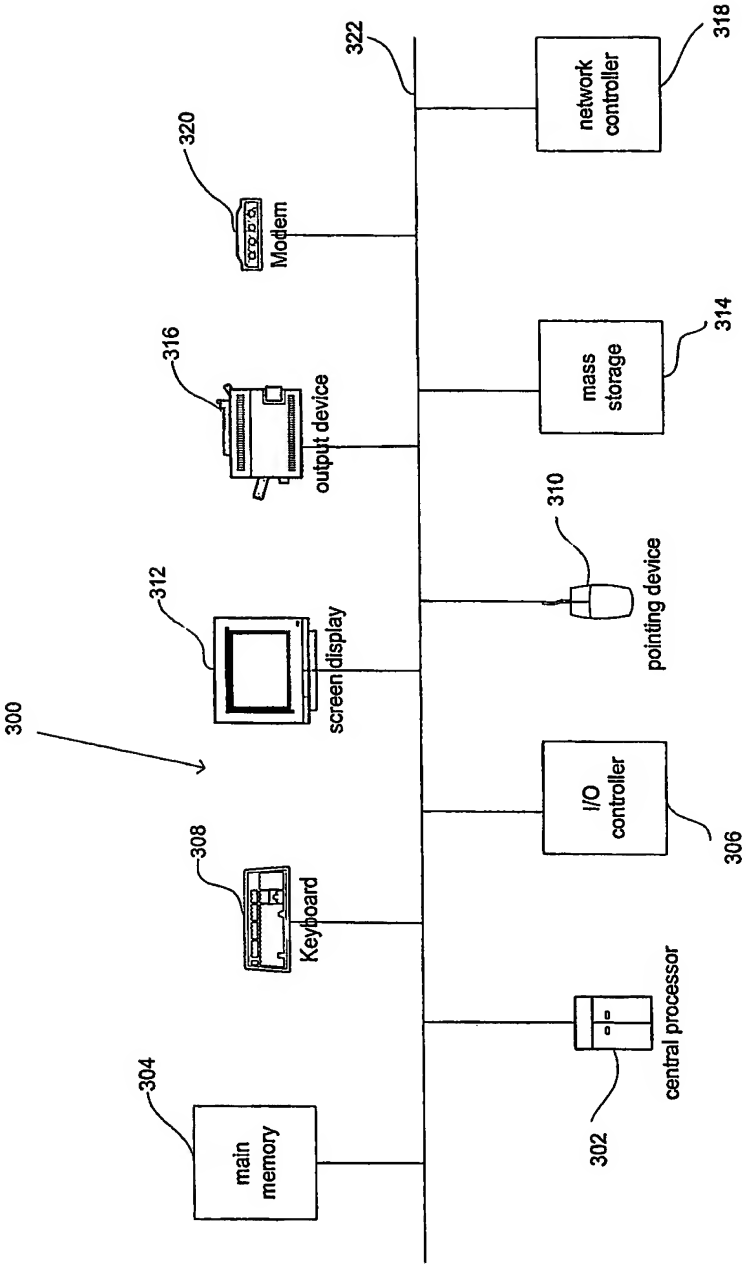

300
322
network controller
318
320
Modem
316
output device
mass storage
314
310
pointing device
312
screen display
I/O controller
306
308
Keyboard
central processor
302
304
main memory

FIGURE 3

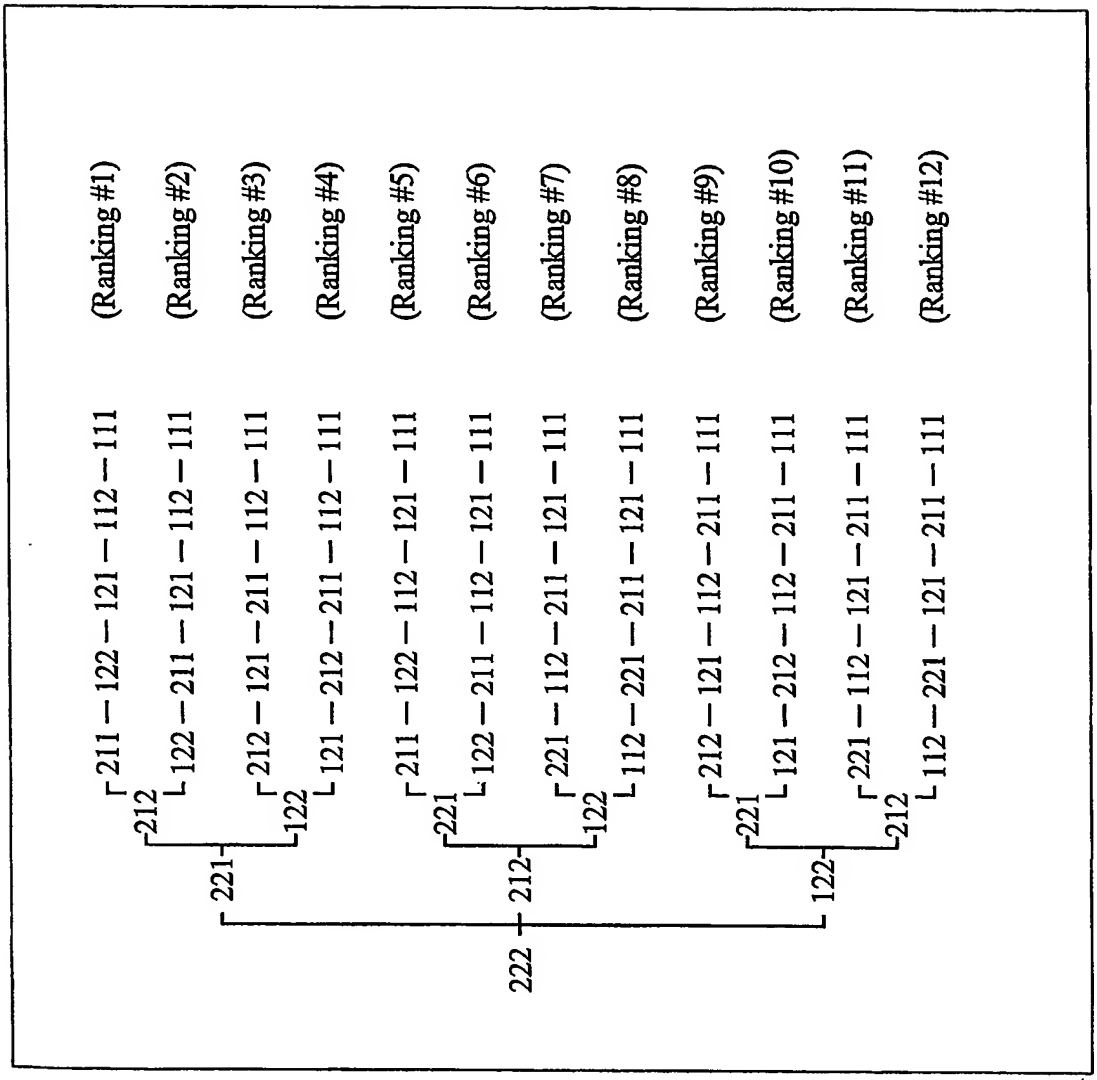

222
221
212
122
211 – 122 – 121 – 112 – 111 (Ranking #1)
122 – 211 – 121 – 112 – 111 (Ranking #2)
212 – 121 – 211 – 112 – 111 (Ranking #3)
121 – 212 – 211 – 112 – 111 (Ranking #4)
211 – 122 – 112 – 121 – 111 (Ranking #5)
122 – 211 – 112 – 121 – 111 (Ranking #6)
221 – 112 – 211 – 121 – 111 (Ranking #7)
112 – 221 – 211 – 121 – 111 (Ranking #8)
212 – 121 – 112 – 211 – 111 (Ranking #9)
121 – 212 – 112 – 211 – 111 (Ranking #10)
221 – 112 – 121 – 211 – 111 (Ranking #11)
112 – 221 – 121 – 211 – 111 (Ranking #12)

FIGURE 4

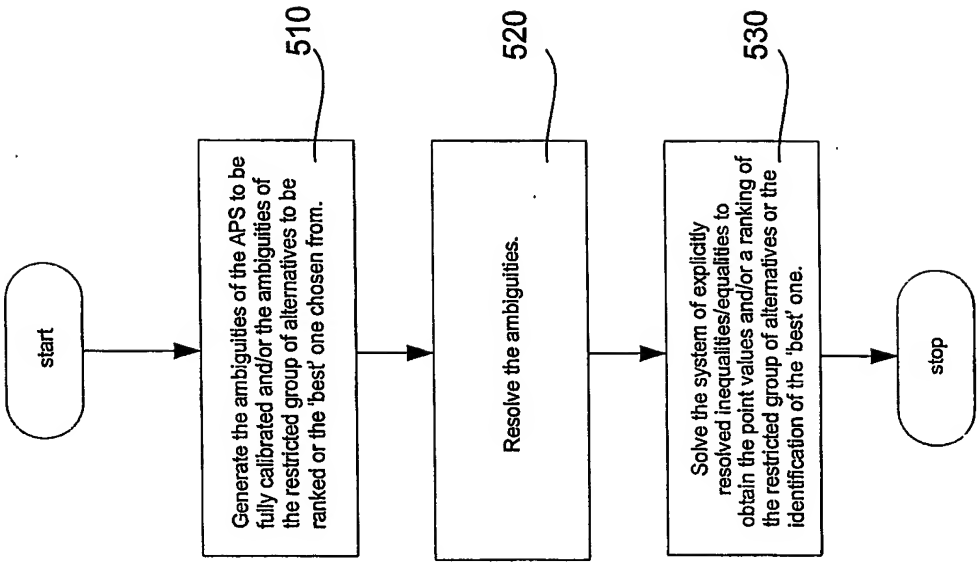

start
Generate the ambiguities of the APS to be fully calibrated and/or the ambiguities of the restricted group of alternatives to be ranked or the 'best' one chosen from.
510
Resolve the ambiguities.
520
Solve the system of explicitly resolved inequalities/equalities to obtain the point values and/or a ranking of the restricted group of alternatives or the identification of the 'best' one.
530
stop

FIGURE 5

versus (*vs*)	221 *a2+b2+c1*	212 *a2+b1+c2*	122 *a1+b2+c2*	112 *a1+b1+c2*	121 *a1+b2+c1*	211 *a2+b1+c1*
221 *a2+b2+c1*		*b2+c1 vs b1+c2*	*a2+c1 vs a1+c2*	*a2+b2+c1 vs a1+b1+c2*	n.a.	n.a.
212 *a2+b1+c2*			*a2+b1 vs a1+b2*	n.a.	*a2+b1+c2 vs a1+b2+c1*	n.a.
122 *a1+b2+c2*				n.a.	n.a.	*a1+b2+c2 vs a2+b1+c1*
112 *a1+b1+c2*					*b1+c2 vs b2+c1*	*a1+c2 vs a2+c1*
121 *a1+b2+c1*						*a1+b2 vs a2+b1*
211 *a2+b1+c1*						

FIGURE 6

Criteria (x)	Categories (y)	Profiles (y^x)	Pairwise comparisons $y^x(y^x-1)/2$	Degrees	Total ambiguities (Equation 1)	Unique ambiguities (Equation 2)
3	2	8	28	2nd	6	3
				3rd	3	3
				All degrees:	*9*	*6*
3	3	27	351	2nd	81	27
				3rd	81	81
				All degrees:	*162*	*108*
3	4	64	2,016	2nd	432	108
				3rd	648	648
				All degrees:	*1,080*	*756*
4	2	16	120	2nd	24	6
				3rd	24	12
				4th	7	7
				All degrees:	*55*	*25*
4	3	81	3,240	2nd	486	54
				3rd	972	324
				4th	567	567
				All degrees:	*2,025*	*945*
4	4	256	32,640	2nd	3,456	216
				3rd	10,368	2,592
				4th	9,072	9,072
				All degrees:	*22,896*	*11,880*
4	5	625	195,000	2nd	15,000	600
				3rd	60,000	12,000
				4th	70,000	70,000
				All degrees:	*145,000*	*82,600*
5	2	32	496	2nd	80	10
				3rd	120	30
				4th	70	35
				5th	15	15
				All degrees:	*285*	*90*
5	3	243	29,403	2nd	2,430	90
				3rd	7,290	810
				4th	8,505	2,835
				5th	3,645	3,645
				All degrees:	*21,870*	*7,380*

FIGURE 7

Criteria (x)	Categories (y)	Profiles (y^x)	Pairwise comparisons $y^x(y^x-1)/2$	Degrees	Total ambiguities (Equation 1)	Unique ambiguities (Equation 2)
5	4	1,024	523,776	2nd	23,040	360
				3rd	103,680	6,480
				4th	181,440	45,360
				5th	116,640	116640
				All degrees:	*424,800*	*168,840*
5	5	3,125	4,881,250	2nd	125,000	1,000
				3rd	750,000	30,000
				4th	1,750,000	350,000
				5th	1,500,000	1,500,000
				All degrees:	*4,125,000*	*1,881,000*
6	2	64	2,016	2nd	240	15
				3rd	480	60
				4th	420	105
				5th	180	90
				6th	31	31
				All degrees:	*1,351*	*301*
6	3	729	265,356	2nd	10,935	135
				3rd	43,740	1,620
				4th	76,545	8,505
				5th	65,610	21,870
				6th	22,599	22,599
				All degrees:	*219,429*	*54,729*
6	4	4,096	8,386,560	2nd	138,240	540
				3rd	829,440	12,960
				4th	2,177,280	136,080
				5th	2,799,360	699,840
				6th	1,446,336	1,446,336
				All degrees:	*7,390,656*	*2,295,756*
10	4	1,048,576	549,755,289,600	2nd	106,168,320	1,620
				3rd	1,274,019,840	77,760
				4th	7,803,371,520	1,905,120
				5th	30,098,718,720	29,393,280
				6th	77,755,023,360	303,730,560
				7th	135,444,234,240	2,116,316,160
				8th	153,584,087,040	9,599,005,440
				9th	102,792,499,200	25,698,124,800
				10th	30,898,215,936	30,898,215,936
				All degrees:	*539,756,338,876*	*68,646,770,676*

FIGURE 8

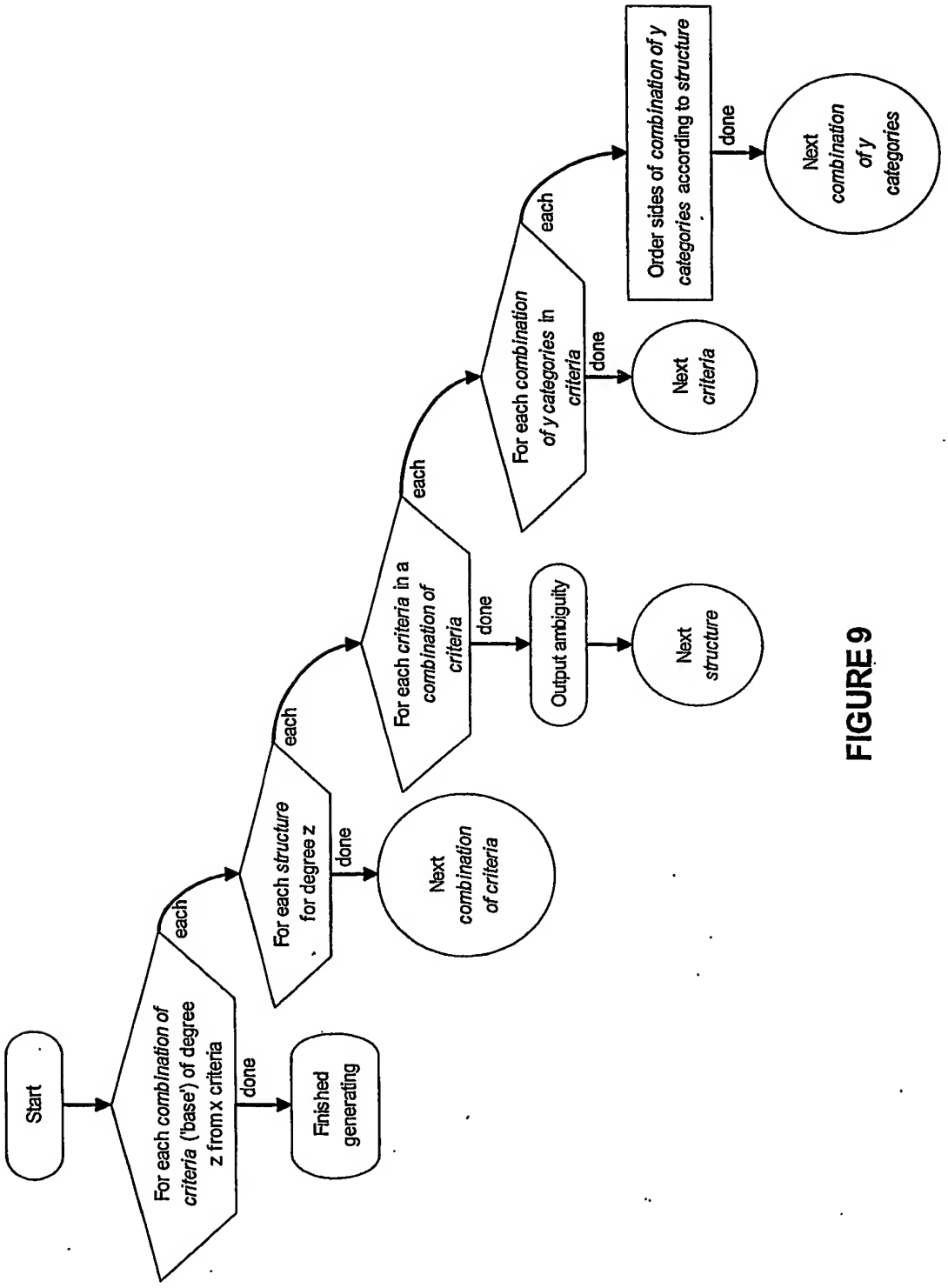

Start
For each combination of criteria ('base') of degree z from x criteria
each
done
Finished generating
For each structure for degree z
each
done
Next combination of criteria
For each criteria in a combination of criteria
each
done
Output ambiguity
Next structure
For each combination of y categories in criteria
each
done
Next criteria
Order sides of combination of y categories according to structure
done
Next combination of y categories

FIGURE 9

3rd-degree ambiguity	Sufficient conditions for LHS > RHS of the 3rd-degree ambiguity
(4) $a2 + b2 + c1$ *vs* $a1 + b1 + c2$	$a2 + c1 > a1 + c2$ or $a2 + c1 = a1 + c2$ or $b2 + c1 > b1 + c2$ or $b2 + c1 = b1 + c2$
(5) $a2 + b1 + c2$ *vs* $a1 + b2 + c1$	$b1 + c2 > b2 + c1$ or $b1 + c2 > b2 + c1$ or $a2 + b1 = a1 + b2$ or $a2 + b1 = a1 + b2$
(6) $a1 + b2 + c2$ *vs* $a2 + b1 + c1$	$a1 + c2 > a2 + c1$ or $a1 + c2 = a2 + c1$ or $a1 + b2 > a2 + b1$ or $a1 + b2 = a2 + b1$

FIGURE 10

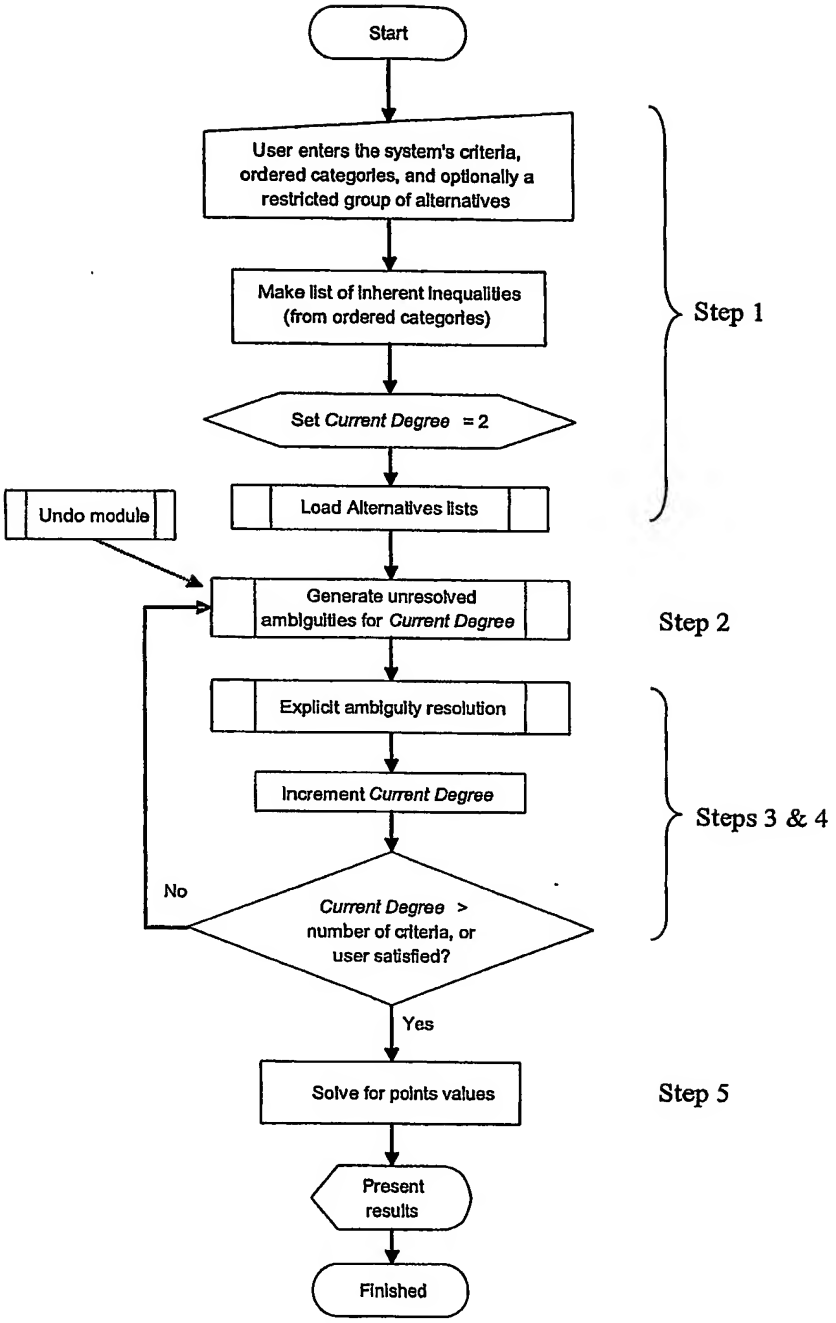

Start
User enters the system's criteria, ordered categories, and optionally a restricted group of alternatives
Make list of inherent inequalities (from ordered categories)
Set Current Degree = 2
Load Alternatives lists
Step 1
Undo module
Generate unresolved ambiguities for Current Degree
Step 2
Explicit ambiguity resolution
Increment Current Degree
Steps 3 & 4
No
Current Degree > number of criteria, or user satisfied?
Yes
Solve for points values
Step 5
Present results
Finished

FIGURE 11

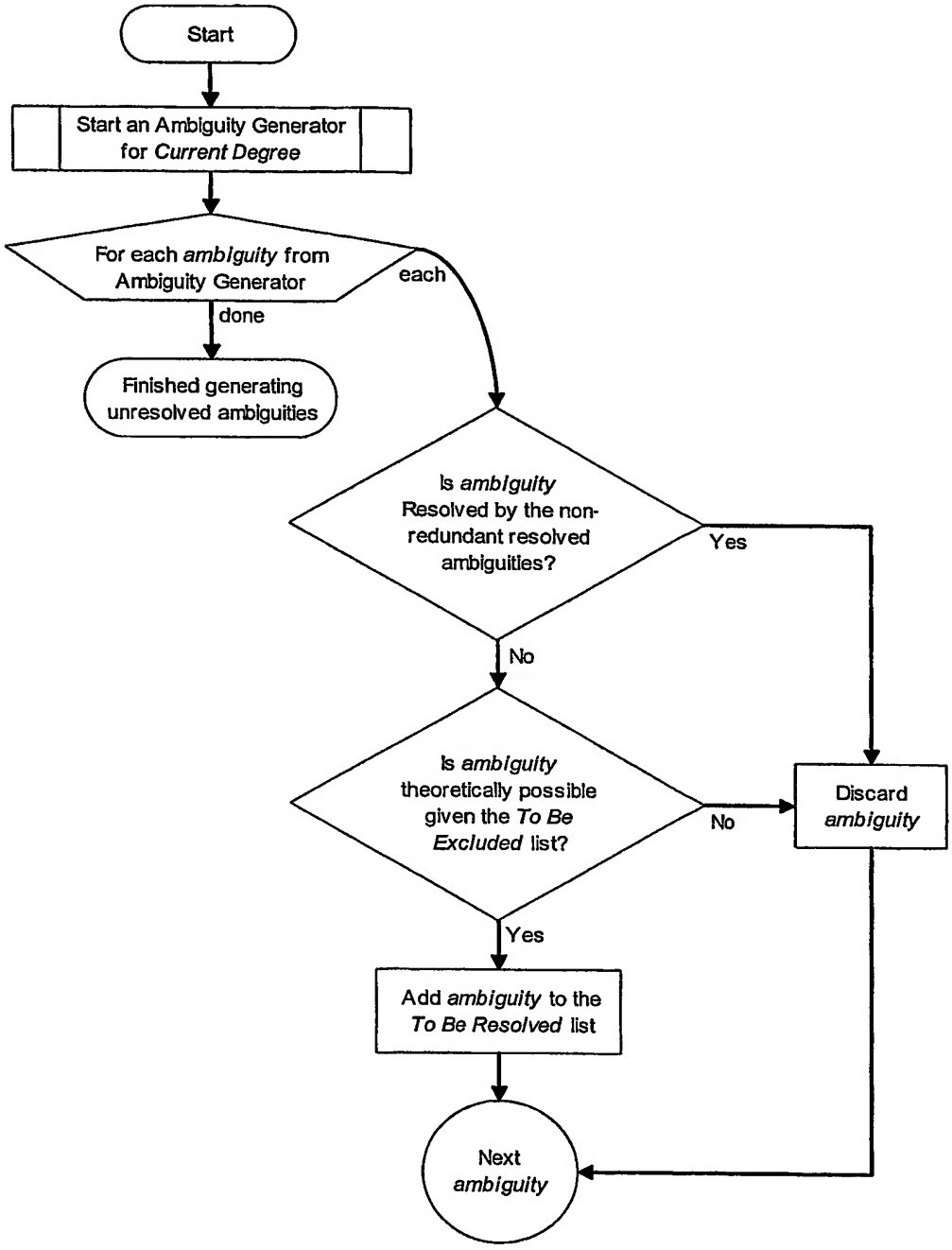

Start
Start an Ambiguity Generator for *Current Degree*
For each *ambiguity* from Ambiguity Generator
each
done
Finished generating unresolved ambiguities
Is *ambiguity* Resolved by the non-redundant resolved ambiguities?
Yes
No
Is *ambiguity* theoretically possible given the *To Be Excluded* list?
No
Discard *ambiguity*
Yes
Add *ambiguity* to the *To Be Resolved* list
Next *ambiguity*

FIGURE 12

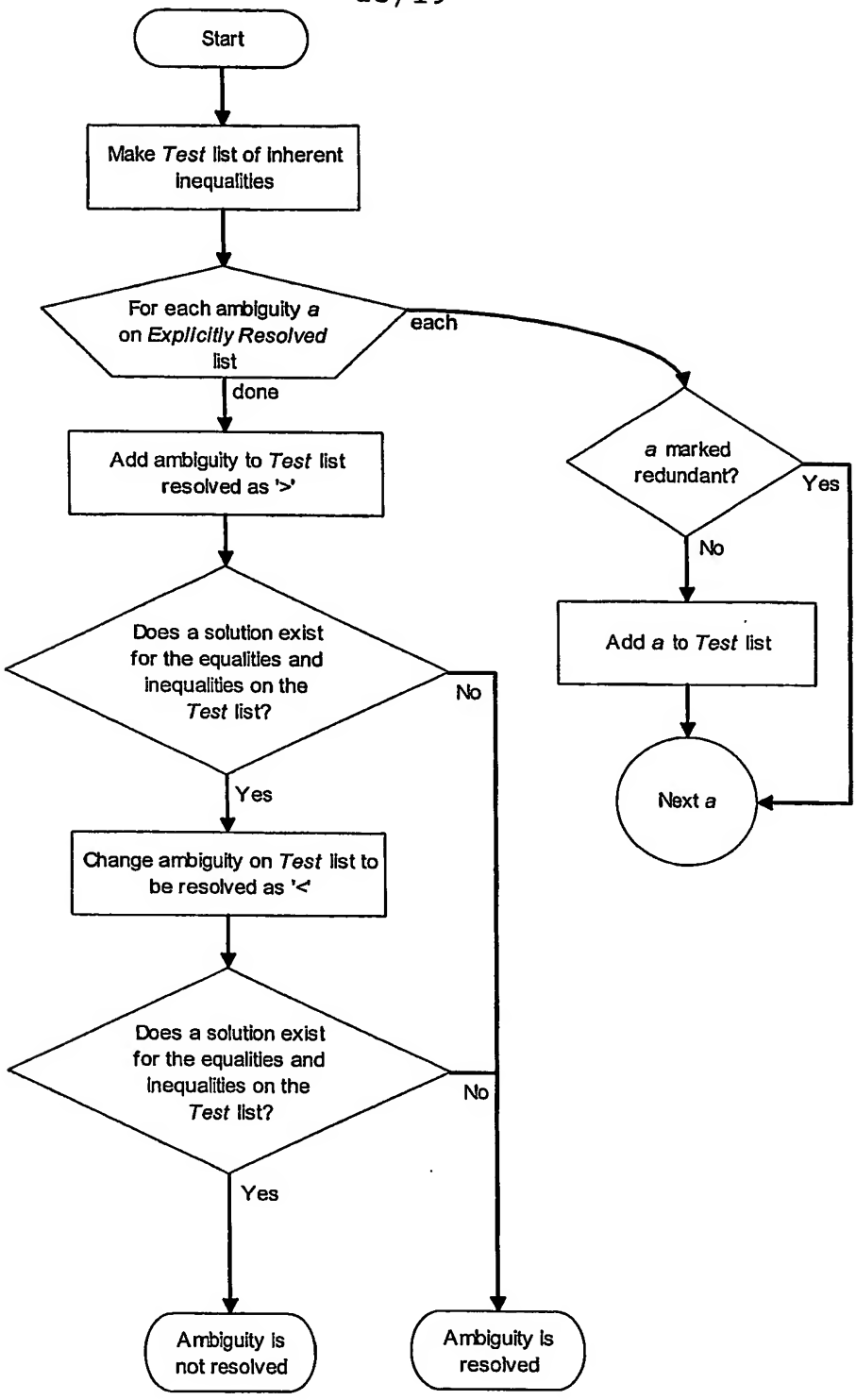

Start
Make *Test* list of inherent inequalities
For each ambiguity *a* on *Explicitly Resolved* list
each
done
a marked redundant?
Yes
No
Add *a* to *Test* list
Next *a*
Add ambiguity to *Test* list resolved as '>'
Does a solution exist for the equalities and inequalities on the *Test* list?
No
Yes
Change ambiguity on *Test* list to be resolved as '<'
Does a solution exist for the equalities and inequalities on the *Test* list?
No
Yes
Ambiguity is not resolved
Ambiguity is resolved

FIGURE 13

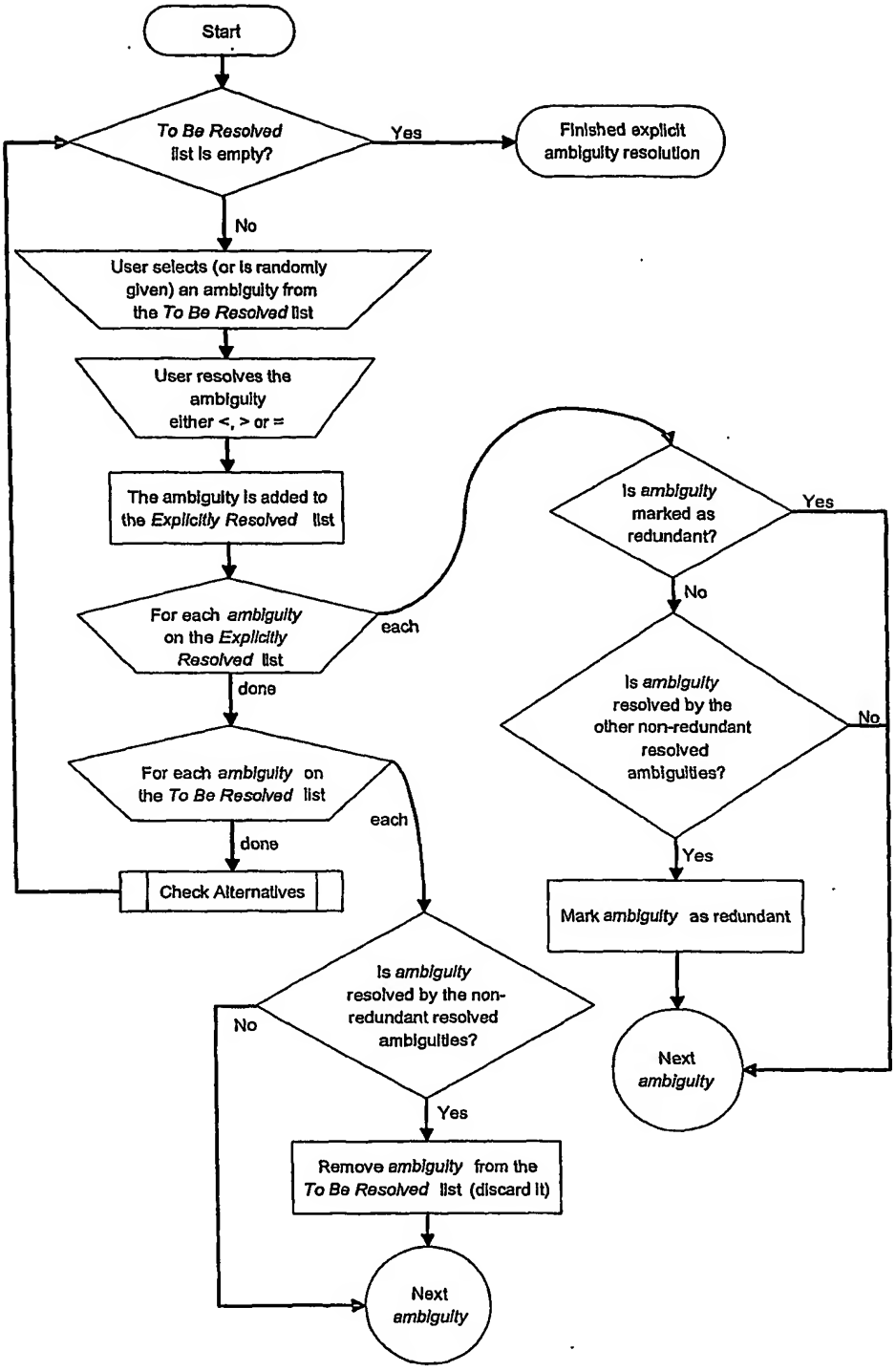

Start
To Be Resolved list is empty?
Yes
Finished explicit ambiguity resolution
No
User selects (or is randomly given) an ambiguity from the To Be Resolved list
User resolves the ambiguity either <, > or =
The ambiguity is added to the Explicitly Resolved list
For each ambiguity on the Explicitly Resolved list
each
done
Is ambiguity marked as redundant?
Yes
No
Is ambiguity resolved by the other non-redundant resolved ambiguities?
No
Yes
Mark ambiguity as redundant
For each ambiguity on the To Be Resolved list
each
done
Check Alternatives
Is ambiguity resolved by the non-redundant resolved ambiguities?
No
Yes
Remove ambiguity from the To Be Resolved list (discard it)
Next ambiguity
Next ambiguity

FIGURE 14

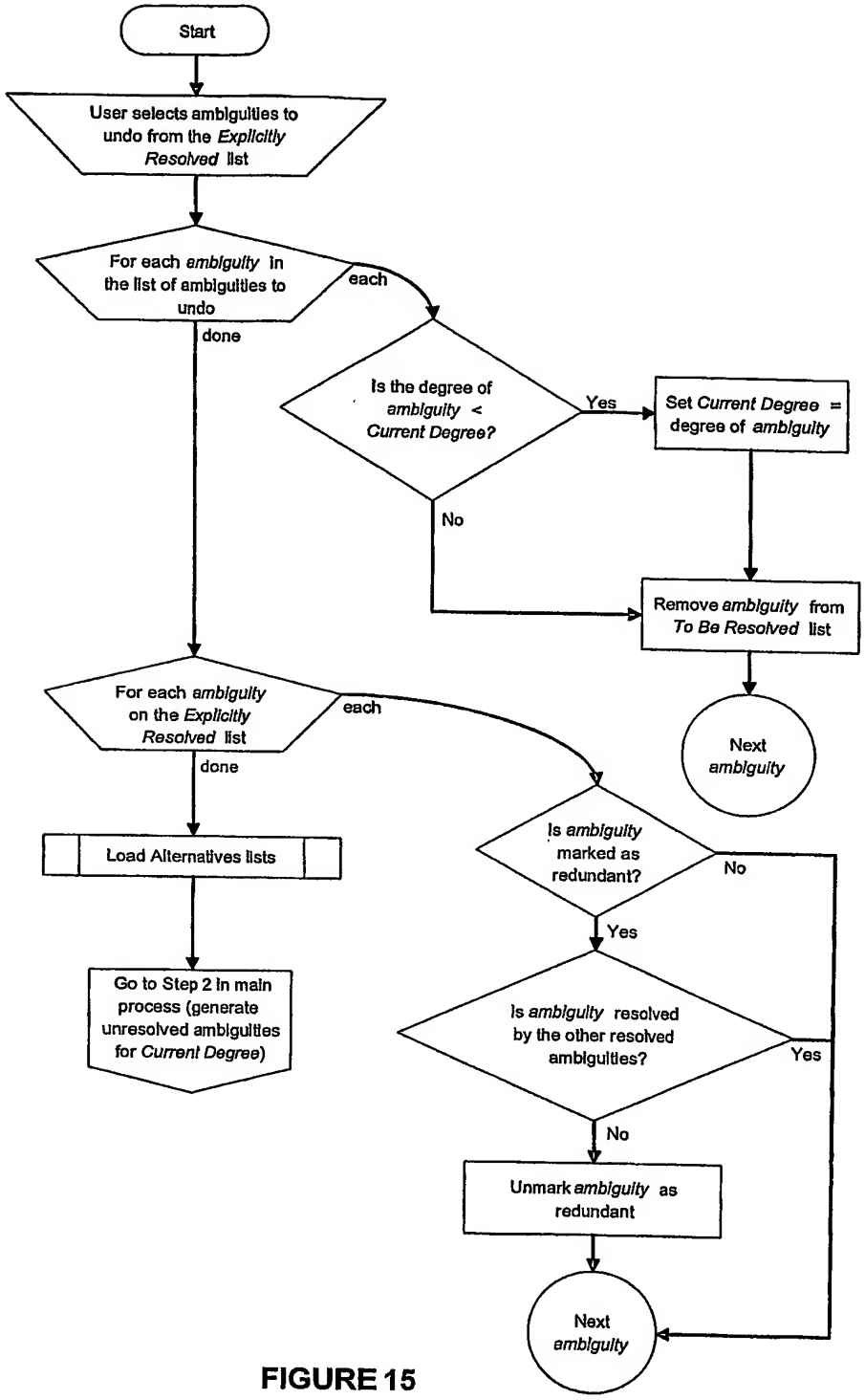

Start
User selects ambiguities to undo from the Explicitly Resolved list
For each ambiguity in the list of ambiguities to undo
each
done
Is the degree of ambiguity < Current Degree?
Yes
Set Current Degree = degree of ambiguity
No
Remove ambiguity from To Be Resolved list
Next ambiguity
For each ambiguity on the Explicitly Resolved list
each
done
Load Alternatives lists
Go to Step 2 in main process (generate unresolved ambiguities for Current Degree)
Is ambiguity marked as redundant?
No
Yes
Is ambiguity resolved by the other resolved ambiguities?
Yes
No
Unmark ambiguity as redundant
Next ambiguity

FIGURE 15

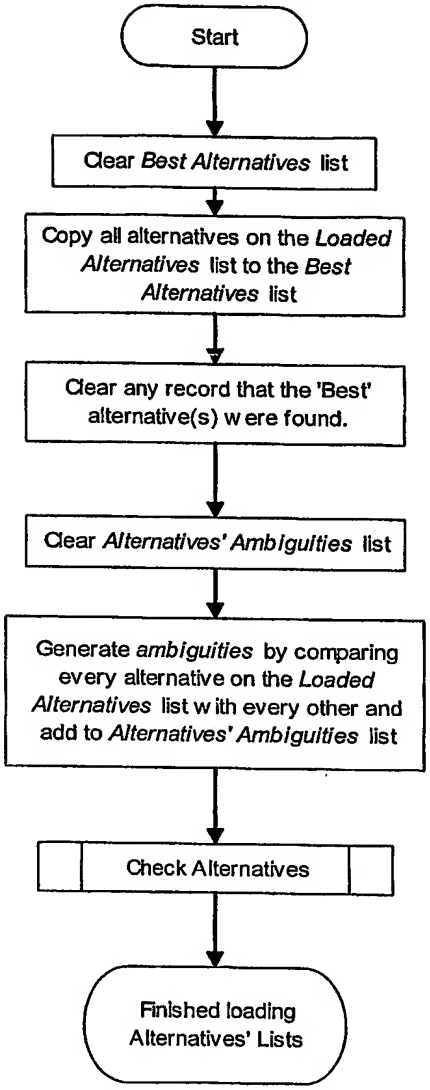

Start
Clear *Best Alternatives* list
Copy all alternatives on the *Loaded Alternatives* list to the *Best Alternatives* list
Clear any record that the 'Best' alternative(s) were found.
Clear *Alternatives' Ambiguities* list
Generate *ambiguities* by comparing every alternative on the *Loaded Alternatives* list with every other and add to *Alternatives' Ambiguities* list
Check Alternatives
Finished loading Alternatives' Lists

FIGURE 16

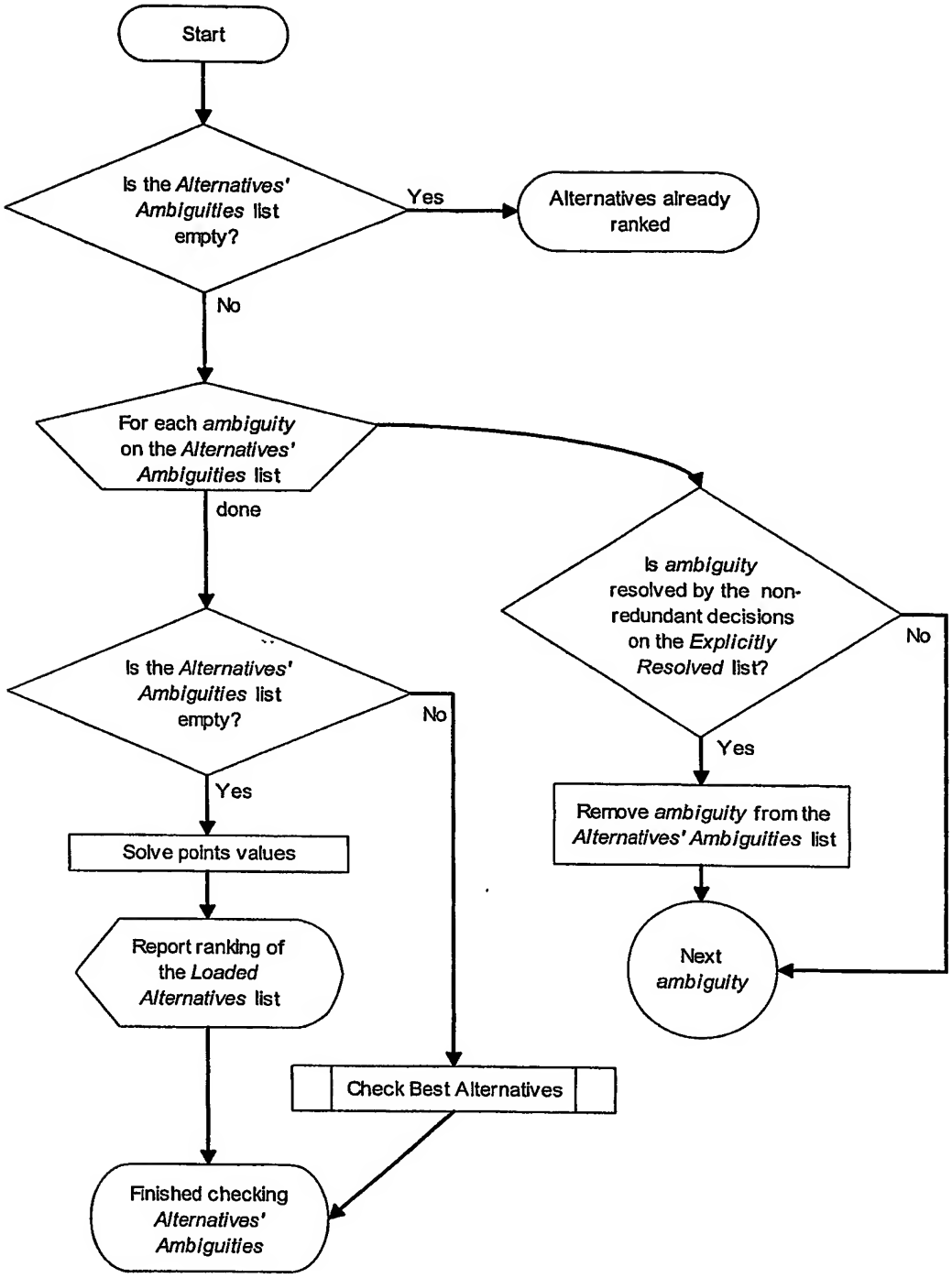

Start
Is the Alternatives' Ambiguities list empty?
Yes
Alternatives already ranked
No
For each ambiguity on the Alternatives' Ambiguities list
done
Is the Alternatives' Ambiguities list empty?
No
Yes
Solve points values
Report ranking of the Loaded Alternatives list
Finished checking Alternatives' Ambiguities
Check Best Alternatives
Is ambiguity resolved by the non-redundant decisions on the Explicitly Resolved list?
No
Yes
Remove ambiguity from the Alternatives' Ambiguities list
Next ambiguity

FIGURE 17

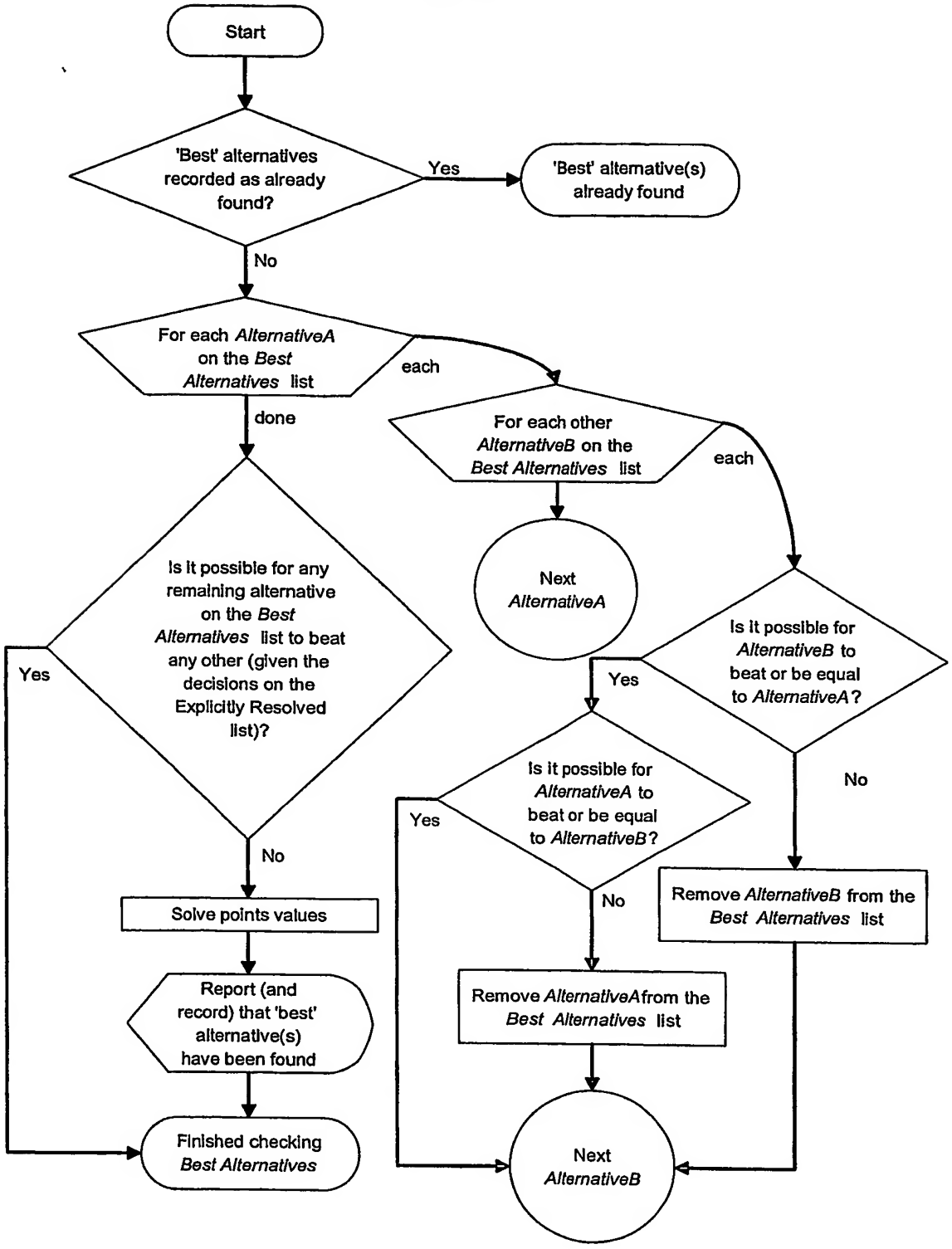

Start
'Best' alternatives recorded as already found?
Yes
'Best' alternative(s) already found
No
For each AlternativeA on the Best Alternatives list
each
done
For each other AlternativeB on the Best Alternatives list
each
Next AlternativeA
Is it possible for any remaining alternative on the Best Alternatives list to beat any other (given the decisions on the Explicitly Resolved list)?
Yes
No
Is it possible for AlternativeB to beat or be equal to AlternativeA?
Yes
No
Is it possible for AlternativeA to beat or be equal to AlternativeB?
Yes
No
Remove AlternativeB from the Best Alternatives list
Solve points values
Report (and record) that 'best' alternative(s) have been found
Remove AlternativeA from the Best Alternatives list
Finished checking Best Alternatives
Next AlternativeB

FIGURE 18

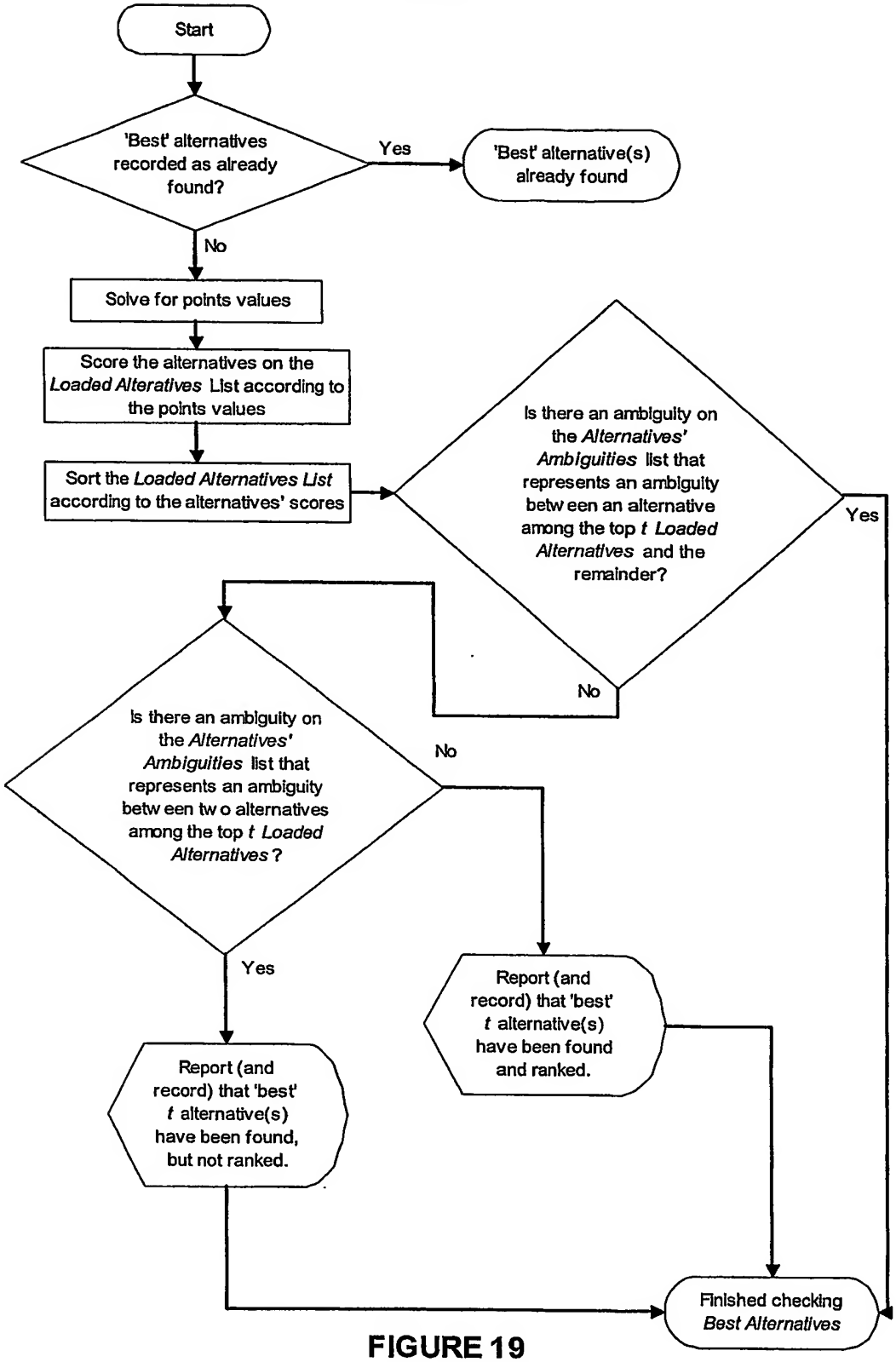

Start
'Best' alternatives recorded as already found?
Yes
'Best' alternative(s) already found
No
Solve for points values
Score the alternatives on the *Loaded Alteratives* List according to the points values
Sort the *Loaded Alternatives List* according to the alternatives' scores
Is there an ambiguity on the *Alternatives' Ambiguities* list that represents an ambiguity betw een an alternative among the top *t Loaded Alternatives* and the remainder?
Yes
No
Is there an ambiguity on the *Alternatives' Ambiguities* list that represents an ambiguity betw een tw o alternatives among the top *t Loaded Alternatives*?
No
Yes
Report (and record) that 'best' *t* alternative(s) have been found and ranked.
Report (and record) that 'best' *t* alternative(s) have been found, but not ranked.
Finished checking *Best Alternatives*

FIGURE 19